Smoking status in Iranian male adolescents: A cross-sectional study and a meta-analysis

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Smoking status in Iranian male adolescents: A cross-sectional study and a meta-analysis

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ABSTRACT

The present study aimed to estimate the prevalence of smoking status and its associated factors in Iranian adolescents and a meta-analysis of recent cross-sectional studies in order to estimate the corresponding prevalence for all Iranian adolescents.

In a cross-sectional study, 1064 male high school students in Zanjan city (northwest of Iran) were recruited. A self-administered questionnaire was used for smoking status and associated factors. Through the meta-analysis, all relevant published studies were reviewed.

Almost one-third of adolescents (34.2%, n= 354) has experienced smoking either experimentally (23.4%, n=242), or regularly (10.8%, n=112). Multivariate analysis showed that older age (OR=1.20; 95% CI: 1.05-1.37), risky behaviors (OR=1.83; 1.25-2.68), Tramadol medication (OR=2.19; 1.54-3.11), low self-esteem (OR=1.07; 1.03-1.11), positive attitude toward smoking (OR=1.15; 1.09-1.21), positive thinking about smoking (OR=1.07; 1.01-1.14) and having smoker friends (OR=1.94; 1.36-2.77) were significantly associated with cigarette smoking in adolescents. Meta-analysis results showed that 7 % of Iranian adolescents are regular smokers and 27 % are experimenters.

Increasing prevalence of smoking in Iranian adolescents is a major concern for public health. Controlling risky behaviors and increasing health education are recommended.

Keyword: Adolescents, Iranian, smoking status, meta-analysis

1. INTRODUCTION

Smoking is one of the important causes of public health problems around the world (Delpisheh, Attia, Drammond, & Brabin, 2006). One of the most significant challenges for smoking cessation programs is prevention of smoking onset during mid or late adolescence (Hiemstra, Otten, & Engels, 2012). It has been revealed that distal and proximal risk factors including smoker peers, socioeconomic status (SES), family condition and risk-taking behaviors affect the probability of start smoking in adolescents (Delpisheh, Kelly, Rizwan, & Brabin, 2006) (Wang, Ho, Lo, & Lam, 2012) (Schaefer, Haas, & Bishop, 2012). There are debates about recently emerged risk factor such as Tramadol and other prescription medications for adolescent smoking. Despite, effect of these drugs on abuser people (Epstein, Preston, & Jasinski, 2006) (Farajidana, Hassanian-Moghaddam, Zamani, & Sanaei-Zadeh, 2012) (Marechal, Honorat, & Claudet, 2011), its association with adolescent smoking is of grate concerns for public health.

Twenty five European countries studied, showed a prevalence of 22% for adolescent smoking in males (Baska, Warren, Baskova, & Jones, 2009), which is obviously higher than the corresponding rate for Iranian adolescents from 2.5 to 17% (Alireza Ayatollahi, Mohammadpoorasl, & Rajaeifard, 2005) (Mohammadpoorasl, Fakhari, Shamsipour, Rostami, & Rashidian, 2011) (Kelishadi, et al., 2006). Reviewing cross-sectional studies in Iran showed different prevalence rates across the country. So far, no meta-analysis has been conducted in Iran to assess differences between provinces in terms of adolescent smoking and calculate a combined prevalence.

The present study aimed to calculate adolescent smoking prevalence in Zanjan city (northwest of Iran) in the 2011-2012 school year and to examine the psychological, pharmaceutical and social factors associated with adolescent smoking. A meta-analysis of recent cross-sectional studies in Iran was also conducted in order to estimate adolescent smoking in Iran.

2. MATERIALS & METHODS

Study participants were male students who were randomly recruited from 61 classes out of 42 high schools in Zanjan city. Initially, about12000 high school students at grades 9^{th}, 10^{th}, 11^{th} and 12^{th} from 42 high schools were identified. Of them1100 (9.1%) were selected by cluster and stratified samplings.

The questionnaire design, type of variables, variables scales and its reliability and validity has been reported in detail elsewhere (Alireza Ayatollahi, et al., 2005). Smoking prevalence was determined using a valid algorithm as never smokers, experimenter and regular smokers accordingly (Kaplan, Napoles-Springer, Stewart, & Perez-Stable, 2001).

To detect the prescription medications status, the following direct question was added to the questionnaire; "Have you ever used either Tramadol, or Ritalin?"

The general risk taking behavior was measured according to Kaplan method (Kaplan, et al., 2001) and self-esteem was measured using the Rosenberg 10-item questionnaire (Alireza Ayatollahi, et al., 2005). The attitude toward smoking was measured according to Hill (Hill, Boudreau, Amyot, Dery, & Godin, 1997). To investigate the reaction of relatives and closest friends about smoking behaviors, the following question was asked;" If you lit up a cigarette in front of your father/mother/brother/sister/closest friend, how he/or she would react?" Two severe and mild reactions were considered for the answers. Socio-economic status (SES) was built through relevant characteristics such as parental education, house furniture and family income.

A logistic regression model was used to calculate adjusted odds ratios and chi-square test was used to examine the association between smoking status and independent variables. The one-way analysis of variance (ANOVA) was used to compare mean score of self-esteem, attitude toward smoking and positive thinking about smoking and two-way analysis of variance (MANOVA) was used to assess interested interaction.

For the meta-analysis, all available data concerning adolescent smoking in Iran were investigated. The search was done on May 15, 2012. Studies were found with

electronically searched MEDLINE, EMBASE, and the ISI the Web of Science using the following search strategy: "Adolescents" OR "Teen" OR "Teenager" OR "Youth" AND "Smoking" OR "Cigarette smoking" OR "Tobacco smoking" AND "Iran". Meanwhile, all national databases including Magiran, IranDoc, SID, IranPsych and IranMedex were systematically searched. Finally, data from 27 studies was prepared and included. It was considered prevalence of regular and experimental smoking in adolescents as interested measure.

Heterogeneity was assessed using chi-square test with significance level of < 0.1 and the I^2 statistic for estimation of inconsistency in meta-analyses. The random effect model was used to calculate the pooled prevalence and Egger test for evaluation of publication bias. All analyses were carried out using Stata SE 11.2 and SPSS (version 20).

3. RESULTS

3.1. Cross-sectional study:

The response rate was 94% (1035/1100). Mean age was 17.2 ±1.3 years ranged between14 to 21years. Out of 354 (34.2%) adolescent smokers, 242 (23.4%) were classified as experimenters and 112 (10.8%) as regular smokers. Overall, 404 students (42.5%) had at least one friend who smoked. In terms of medications, 73 (36.0%) and 50 (4.8%) students had used either Tramadol and/or Ritalin respectively. Mean self-esteem scores in never smokers, experimenter and regular smokers were 17.2±4.9, 19.4±4.9 and 19.3±5.4 respectively ($p<0.001$). Mean score of positive attitude toward smoking in never smokers, experimenters and regular smokers were -10.4±3.2, -7.8 ±4.9, and -4.01±6.4 respectively ($p<0.001$). Majority of students (78.2 %) reported easy access to cigarettes. Demographic characteristics are presented in Table 1.

The logistic regression revealed that older age, having general risk taking behaviors, Tramadol, lower self-esteem, positive attitude toward smoking, positive thinking about smoking and having smoker friend were significantly associated with cigarette smoking in adolescents (Table 2).

3.2. Meta-analysis results

We found 27 relevant studies (A Mohammadpoorasl, et al., 2011) (Habib E, Shirzad AS, Naseri-Kouzehgarani G, Hooman S, & Reza MM, 2012) (Alaei Khorayem R, Kadeyor P, Mohamadkhani Sh, Sarami GhR, & Alaei Khorayem S, 2011) (Ramzankhani A, Sarbandi Zaboli F, Zargi A, Heydari GhR, & Masjedi MR, 2010) (Rahmaniyan KA, Jafarzadeh A, & Khaloei A, 2010) (Najafi K, Fekri F, & etal, 2007) (Namakin K, Sharifzadeh Gh, & Miri MR, 2008) (Mohammadpoor Asl, Fakhari, Rostami, & Pourafkary, 2007) (Barikani A, 2008) (Ziaaddini H, Kheradmand A, Nakhaei N, & Taherzadeh H, 2008) (Ziaaddini H, et al., 2008) (Miri M, Moasheri B, & Hanafi H, 2004) (Mohtasham Amiri Z, 2008) (Mojahed A & Bakhshani Nm, 2004) (Heydari, Sharifi, Hosseini, & Masjedi, 2007) (Alireza Ayatollahi, et al., 2005) (Aslinejad M, Alemi A, & Chamanzari H, 2004) (Mokhtari Habashi Gh, Bahrani N, & SobhRakhshankhah M, 2001) (Jafarzadegan T & Zarehei F, 2001) (Ahmadi & Hasani, 2003) (Ahmadi & Ostovan, 2002) (Aghaei A, 2001) (Ziaei P, 2001) (Shariat Zadeh M & Sadeghi A, 2001) (Hamidzadeh Y & Hosieni Ahog MM, 2001) (Najafi, et al., 2004). In 14 studies and in 26 studies enough data were available to calculate the prevalence of regular and experimental smoking respectively. Sample sizes in meta-analysis of experimental smoking were 26012 and19732 for regular smoking.

There were evidences for heterogeneity both in meta-analysis of either experimental (Q=885.36, p=0.001, I^2 = 97.3%) or regular smoking (Q=369.22, p=0.001, I^2 =96.5%). To deal with heterogeneity the random-effect model was used. The pooled prevalence estimation for experimental smoking was 27 % (95% CI; CI: 24- 30 %) and for regular smoking was 7 % (5 -9 %). The highest prevalence of regular smoking was reported from Gilan province in 2004 (15 %, 13 -17 %). The lowest prevalence was reported from Kerman in 2001 (2 %, 1 to 4 %). The highest and lowest prevalence of experimental smoking was reported from Qazvin province in 2001 (43 %, 37 - 48 %). and Kerman in 2001 (8 %, 5 to 11 %) respectively. There was no evidence for significant publication bias for experimental smoking in adolescents (Egger's test: 3.92, 95% CI: –

3.32 to 11.18; p=0.27). But, there was a significant publication bias for regular smoking (Egger's test: 9.41; 95% CI, 1.01 to 17.81; p=0.03).

4. DISCUSSION

The prevalence of experimental and regular smoking in Zanjan city was 23.4 and 10.8 % respectively. These findings were higher than previous reports from Tabriz (northwest of Iran), (Mohammadpoor Asl, et al., 2007) and Shiraz (south of Iran) (Alireza Ayatollahi, et al., 2005). The meta-analysis showed that 27% and 7% of Iranian high school student were experimental or regular smokers respectively. This finding is in agreement with the Iran Global Youth Tobacco Survey (GYTS,2007), which reported a figure of 23.7% and 5.1 % for experimental and regular smoking in 13 – 15 year old boys (Azaripour, 2007). Compared to international reports, the prevalence of adolescent smoking was considerably small. The prevalence of regular smoking in the Czech Republic (Baska, et al., 2006), Russian Federation (Baska, et al., 2009), and UK (Delpisheh, et al., 2007) have reported to be from 12% to 34%.

Despite of legislative restrictions of sale tobacco products to adolescents in Iran, majority of them (78.2 %) revealed easy access to cigarettes which means that tobacco control legislation and constraint without intersectional collaboration has only a little impact on cigarette accessibility.

The ordinal logistic regression model showed that increased chance of smoking could be expected by increasing age. This finding is consisted with other studies (Tyas & Pederson, 1998) (Mayhew, Flay, & Mott, 2000).

In the present study, using Tramadol and Ritalin medications were considered as a risk factor for adolescent smoking as these medications are strictly controlled in Iran and only specialists in some specific diseases can prescribe them for patients. Some adolescents are using these drugs without formal prescription. Overall, 36.0 % and 4.8 % of students had reported saw Tramadol and Ritalin respectively. The regression model also supported the hypothesis that using Tramadol has a significant relationship with

adolescent smoking. A possible explanation for this might be the fact that Tramadol have stimulus effect in human (Duke, Bigelow, Lanier, & Strain, 2011) and simultaneous using of Tramadol and cigarette results to increase in metabolism of Tramadol and therefore transient improvement in some psychological characteristics such as self-esteem, sense of kindness, and high energy. The MANOVA test supported the hypothesis that Tramadol and cigarette smoking have significant ordinal interaction on self-esteem ($p<0.001$). Hence, from a cross-sectional view, with abuse of Tramadol, tendency to cigarette smoking may be increased and this process can be known as a gateway for future regular smoking for current experimental adolescent smokers.

It was found that risk taking behavior (Alireza Ayatollahi, et al., 2005) (A Mohammadpoorasl, et al., 2011) (Kaplan, et al., 2001) (A. Mohammadpoorasl, et al., 2011) and smoker friends (Lakon & Valente, 2012) (Harakeh & Vollebergh, 2012) are significantly associated with adolescent smoking. A possible explanation for this might be due to adolescents' tendency of to have friends with similar smoking behavior (Mercken, Steglich, Sinclair, Holliday, & Moore, 2012). Recent studies revealed that "Passive (imitation) peer influence affected young adult smoking rather than active (pressure) peer influence" (Harakeh & Vollebergh, 2012).

It was found that relatives of experimental and regular smokers compared to never smokers have a mild reaction about lighting a cigarette in front of them. Other studies confirmed this result (Hanson, 1997) (Kaplan, et al., 2001) (Hruba, Zaloudikova, & Matejova, 2010). But there is a little information that fears of relatives or family culture are effective.

There are some limitations in present study. 1. Due to nature of cross-sectional data, assessment of temporality between the related factors and cigarettes smoking was impossible. 2. To examine the relationship between Tramadol abuse and cigarette smoking, it was better to approve abuser people by biologic samples which it was not possible in the present study due to ethical issues. 3. The meta-analysis in Iran has some limitations especially in using standard search key words in national databases. To solve

this problem, all synonyms of search terms in both Persian and English languages were used.

In conclusion, the present study showed a moderately but concerning prevalence of experimental and regular adolescent smoking in Iran and introduced some novel associated risk factors. The effects of Tramadol abusing and its interaction with other psychological characteristic on adolescents' smoking habits should be investigated in future studies. In general, increasing prevalence of smoking in Iranian adolescents is a major concern for public health. Controlling risky behaviors and increasing health education are recommended.

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Table 1 Demographic characteristics and smoking status

Characteristics	Never smoker n (%)	Experimenter [a] n (%)	Regular smoker [b] n (%)	Total n (%)	p-value
Age					
≤15 years	61(81.3)	10(13.3)	4(5.3)	75(7.2)	P<0.001
16 years	159(67.1)	61(25.7)	17(7.2)	237(22.9)	
17 years	227(75.7)	51(17.0)	22(7.3)	300(29.0)	
18 years	141(58.0)	120(28.4)	69(28.4)	243(23.5)	
19 years	72(52.6)	40(29.2)	25(18.2)	137(13.2)	
≥20	21(48.8)	11(25.6)	11(25.6)	43(4.2)	
Total	681(65.8)	242(23.4)	112(10.8)	1035(100)	
Living with parents					
Yes	614(66.3)	211(22.8)	101(10.9)	926(92.2)	P<0.39
No	48(61.5)	23(29.5)	7(9.0)	78(7.8)	
Number of smoker friends					
0	464(77.5)	111(18.5)	24(4.0)	599(60.1)	P<0.001
≥1	190(47.7)	123(30.9)	85(21.4)	398(39.9)	
General risk-taking behavior					
Yes	454(61.9)	194(26.5)	85(11.6)	733(72.2)	P<0.001
No	216(76.6)	42(14.9)	24(8.5)	282(27.8)	
Socioeconomic status					
High class	158(67.2)	54(23.0)	23(9.8)	235(25.1)	P<0.87
Middle class	302(65.2)	110(23.8)	51(11.0)	463(49.4)	
Low class	157(65.7)	52(21.8)	30(12.6)	239(25.5)	
Death of family member					
Yes	57(58.8)	23(23.7)	17(17.5)	97(9.9)	P<0.06
No	593(67.2)	202(22.9)	88(10.0)	883(90.1)	
Membership in a sport team					
Yes	294(65.5)	94(20.9)	61(13.6)	449(45.6)	P<0.01
No	356(66.4)	135(25.2)	45(8.4)	536(54.4)	
Ever seen Tramadol					
Yes	181(48.5)	119(31.9)	73(19.6)	373(36.0)	P<0.001
No	500(75.5)	123(18.6)	39(5.9)	662(64.0)	
Ever seen Ritalin					
Yes	26(52.0)	10(20.0)	14(28.0)	50(4.8)	P<0.001
No	655(66.5)	232(23.6)	98(9.9)	985(95.2)	
Ever seen Ecstasy					
Yes	49(44.5)	32(29.1)	29(26.4)	110(10.6)	P<0.001
No	631(68.3)	210(22.7)	83(9.0)	924(89.4)	
Father norm					
Middle reaction	23(38.3)	19(31.7)	18(30.0)	60(6.1)	P<0.001
Severe reaction	622(67.7)	210(22.9)	87(9.5)	919(93.9)	
Mother norm					
Middle reaction	23(46.0)	11(22.0)	16(32.0)	50(5.0)	P<0.001
Severe reaction	637(67.1)	223(23.5)	90(9.5)	950(95.0)	
Brother norm					
Middle reaction	51(39.8)	44(34.4)	33(25.8)	128(18.6)	P<0.001
Severe reaction	401(71.7)	114(20.4)	44(7.9)	559(81.4)	
Sister norm					
Middle reaction	49(43.4)	38(33.6)	26(23.0)	113(15.7)	P<0.001
Severe reaction	428(70.6)	130(21.5)	48(7.9)	606(84.3)	
friend norm					
Middle reaction	279(55.4)	143(28.4)	82(16.3)	504(50.8)	P<0.001
Severe reaction	372(76.2)	90(18.4)	26(5.3)	488(49.2)	

a. Experimenters: respondents who indicated having tried or experimented with cigarette smoking, even a few puffs, but have smoked less than 100 cigarettes.

b. Regular smokers: respondents who indicated smoking 100 cigarettes or more in their lifetime irrespective of current smoking status.

Table 2 Odds ratios (OR) and 95% confidence intervals (95% CI) of smoking of adolescents for related factors, based on logistic regression models.

Variables	Univariate model		Multivariate model	
	OR(95% CI)	P-value	OR(95% CI)	P-value
Ever use of Tramadol (yes)	3.27(2.50-4.28)	0.001	2.19(1.54-3.11)	0.001
Age (year)	1.30(1.18-1.44)	0.001	1.20(1.05-1.37)	0.005
Self-esteem (decrease)	1.08(1.06-1.11)	0.001	1.07(1.03-1.11)	0.001
Having general risk taking behaviors (yes)	3.46(2.55-4.70)	0.001	1.83(1.25-2.68)	0.002
Attitude toward smoking (increase)	1.22(1.17-1.27)	0.001	1.15(1.09-1.21)	0.001
Positive thinking about smoking (increase)	1.23(1.18-1.29)	0.001	1.07(1.01-1.14)	0.01
Having a smoker friend (yes)	3.76(2.85-4.95)	0.001	1.94(1.36-2.77)	0.001

Author disclosure

Statement 1: Role of Funding Sources

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Statement 2: Contributors

Milad Nazarzadeh, Dr.Ali delpishe, Ashgar Mohammadpoorasl, Abolfazl Bahrami, Zeinab Bidel and Erfan Ayubi designed the study and wrote the protocol. Zeinab Bidel, Erfan Ayubi and Milad Nazarzadeh conducted literature searches and provided summaries of previous research studies and study selection (especially for meta-analysis). Milad Nazarzadeh conducted the statistical analysis. Milad Nazarzadeh, Ali Delpisheh , Zeinab Bidel and Fateme Jafari wrote the first draft of the manuscript. Farhad Taromian and Ashgar Mohammadpoorasl was our consultant in addiction and psychologic topics. Abolfazl Bahrami manages data collection procedure and Erfan Ayubi data entry procedure. All authors contributed to critical appraisal of article and have approved the final manuscript.

Statement 3: Conflict of Interest

All other authors declare that they have no conflicts of interest.

Statement 4: Acknowledgements

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Highlights

- Meta-analysis of smoking prevalence includes all Iranian high school students.
- Cross-sectional examines of psychological, pharmaceutical and social related factors with smoking.
- Tramadol can be a noble gateway for smoking.
- Adolescents' smoking is much more strongly associated with their peer's smoking.
- Relatives of experimenter and regular smoker have mild reaction about lighting a cigarette in front of them.